C-A OPERATIONS PROCEDURES MANUAL

8.36 General Cleaning Procedure – Activated Heat Exchanger

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Collider-Accelerator Department Chairman Date

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8.36 General Cleaning Procedure – Activated Heat Exchanger

1. Purpose

1.1 To provide general instructions for cleaning heat exchangers, also specific instructions for using Drew Scale – Out liquid acid cleaner to clean heat exchangers.

2. Responsibilities

2.1 Water Systems Group Technicians operate and service these heat exchangers.

3. Prerequisites

3.1 Radiological Worker Training – TLD (Whole Body Dosimetry) required.

3.2 C-A Operations Procedure Training – 8.36 Cleaning Procedure – Activated Heat Exchangers.

3.3 Scale – out and Drewgard 4109 material safety data sheets (MSDS).

4. Precautions

4.1 The Radiological Control Division (RCD) is responsible for performing radiological evaluations and determining ultimate disposition of the magnet cooling water. Notification of RCD Technicians should be made in advance of the cleaning to coordinate necessary support.

4.2 Heat exchanger to be cleaned must be off line, or back-up heat exchanger must be put online. Make sure that the valves for the back-up heat exchanger are open, with both primary and secondary water flowing through it.

4.3 Close all isolation valves for the heat exchanger to be cleaned.

4.4 Personal Protective Equipment (PPE), including rubber gloves, boots and aprons, shall be worn throughout the task. Use of a face shield is required whenever there is a chance of splashing, such as while draining, cleaning and hydro-testing of the heat exchanger after cleaning.

4.5 Water samples required for disposition of waste.

5. Procedures

5.1 Drain secondary, or cooling tower side, of heat exchanger to drain. Drain with hose connected to bottom drain and open vent valve on upper connection.

5.2 Using hose and transfer pump, transfer the activated water from the primary side of the heat exchanger to a tanker (or drums) for storage and disposition. Open the vent valve slowly after transfer of the water has begun.

5.3 After primary side has been transferred, connect a hose from a process domestic water supply to the upper vent connection and flush the magnet water side of the heat exchanger for several minutes. Water used for flushing shall be considered activated and shall be collected in a tanker (or drums) for storage and disposition.

5.4 Remove the process domestic water supply from the heat exchanger.

5.5 Measure and record the compressed position of the heat exchanger plates. Back off tie rod nuts slide back the backing plate and a few heat exchanger plates.

5.6 Before proceeding, allow the RCD Technician to ascertain that the primary side is not radiologically contaminated.

5.7 Clean each plate with a soft brush and water taking care not to damage the heat exchanger gaskets. If no contamination is found in 5.6, then all water used during the cleaning of the heat exchanger can be discharged directly to a storm drain.

5.8 If a more aggressive cleaning method is required, utilize Drew scale – out liquid acid cleaner and Drewgard 4109 proceed as follows:

5.8.1 Requirements

5.8.1.1 Approved containers/vessel for cleaning. Three is recommended.
5.8.1.2 Approved lined drums for waste storage and transport.
5.8.1.3 pH Meter.
5.8.1.4 Refer to 4.4 for minimum PPE requirements.
5.8.1.5 EWP if required.

5.8.2 Procedure

5.8.2.1 Set up three baths with the first bath having a 5-10% of scale – out and water solution. Bath level should be just high enough to immerse one plate and take as long as needed to dissolve the deposit. Periodically check the pH to ensure that it has not neutralized while cleaning pates. Add small amounts of scale – out as needed to maintain the pH of bath water below 4.0 units during cleaning. A soft brush can add in removing stubborn deposits.
5.8.2.2 Second bath is to rinse plates with water.
5.8.2.3 Third bath is used to soak cleaned plate in a 10 to 1 solution of water and 4109 to repassivate the metal.
5.8.2.4 Restore plate on to heat exchanger for drying.
5.8.2.5 Dispose of wastewater in accordance with the ECR representative.

5.9 If any heat exchanger plates are removed from the assembly, it is imperative that they be returned exactly to their original position.

5.10 Inspect and replace any damaged gaskets using the manufacturers recommended gaskets and adhesives.

5.11 Slide exchanger and back plates forward and tighten tie rods in an alternating pattern until the back plate is returned to its original (previously measured) position.

5.12 Fill both sides of the exchanger with process domestic water, close all valves and hydro test the unit with a portable tester. The heat exchanger must maintain a minimum of 150 psig for at least 15 minutes to fulfill the hydro test criteria.

5.13 After fulfilling the hydro test criteria, vent and drain the heat exchanger. During this step of the procedure water drained from the heat exchanger can be discharged directly to a storm drain.

6. Documentation

None